

after many trials during a period of five years had been unsuccessful. The development of large forms under normal conditions of growth probably indicates always the tendency for the transformation into L type, but in many cases our culture methods are inappropriate to induce germination of the large bodies as well as to allow continuous growth of the L forms. All strains in which L type of growth was formerly observed were cultivated from pathological processes. The case described in this note is the first in which this growth developed in a culture obtained from a normal human throat. Influenza bacilli cultivated from the throat have never shown L type of growth. The parainfluenza strains are similar in many respects to the *Streptobacillus moniliformis* which is also a normal inhabitant of the rat's throat.

The L type of colonies developing in the culture of parainfluenza, influenza bacillus, and of gonococcus are inconspicuous and

transitory. However, their development indicates that those processes, the full development of which was observed in *Streptobacillus moniliformis* and in *Bacteroides funduliformis*, are present also in these species. The significance of these processes in the life of the bacteria and in their pathological effects are not known, but such deep-going transformation of the bacteria cannot be without significance.

Summary. In a hemolytic parainfluenza strain a transformation process of the bacteria similar to that occurring in *Streptobacillus moniliformis* and *Bacteroides* were observed. The bacteria swelled up into large round bodies and these, transferred to appropriate media, germinated and produced a tiny colony consisting of granules which invaded the agar. The tiny colonies of granules were transitory and after 8 hours' incubation ceased to grow and disappeared.

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A Method of Obtaining Blood Samples Directly from the Hepatic Vein in Man.

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Studies regarding the function of the liver in man have been hampered by the inability to obtain blood either immediately before or after its passage through the liver. In the course of observations on the circulation during which blood samples were being obtained from the right side of the heart through a catheter in the venous system, we have observed that the tip of the catheter can often be manipulated into one of the hepatic veins, enabling us to withdraw blood from these vessels. The purpose of this note is to call attention to this as a means of obtaining blood directly from the hepatic vein in man.

The liver receives blood from the portal vein and the hepatic artery. The blood from both of these vessels drains into the hepatic

sinusoids, which in turn unite to form the central veins. These come together to make up the hepatic veins, usually 2 or 3 in number, which pass upward to enter the inferior vena cava only a short distance below its entrance into the heart. On rare occasions the hepatic veins may empty directly into the right auricle. No other major veins occupy a position in this locality. Roentgenologists¹ have noted that the hepatic veins may at times be seen crossing the angle formed by the right border of the heart and the diaphragm.

The passage of a catheter through the

¹ Roesler, Hugo, *Clinical Roentgenology of the Cardiovascular System*, C. C. Thomas Co., Baltimore, Md., 1937.

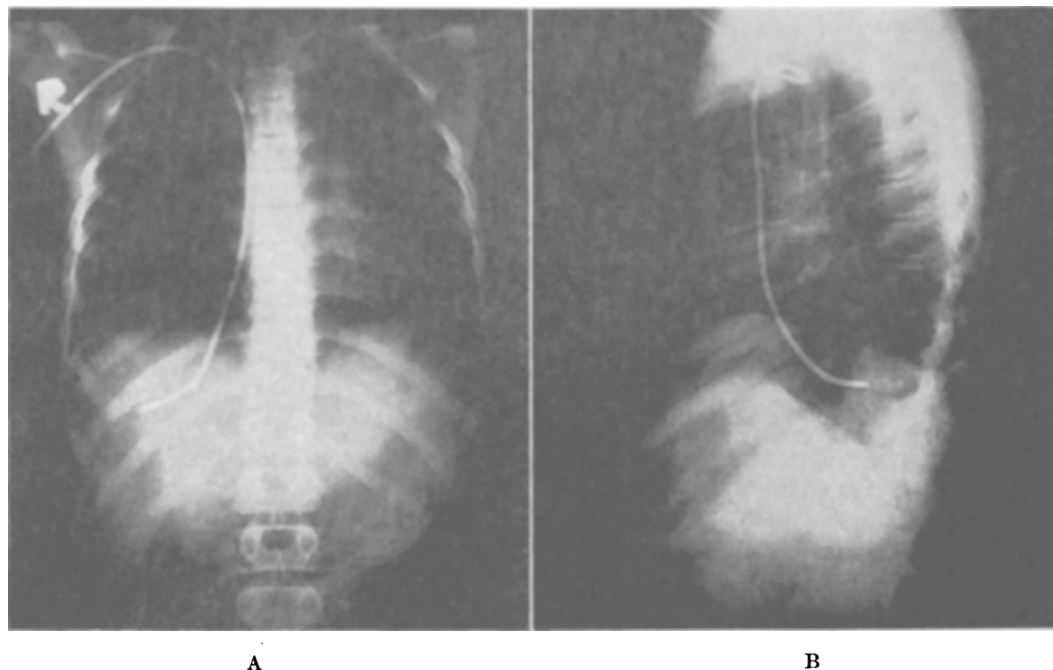


FIG. 1.

X-ray film studies showing catheter in the hepatic vein. A. Antero-posterior view. B. Right lateral view.

venous system to the right auricle was first carried out in man by Forssmann.² Since then various uses of the catheter technic have been reported, but it has remained for Cournand and his associates^{3,4} to demonstrate the utility and safety of the procedure. They have now studied several hundred patients without serious accident. We have carried out the procedure in 75 instances without mishap.

The method for obtaining blood from the hepatic vein is simply an extension of that developed by Cournand *et al.*^{3,4} for obtaining blood from the right auricle. We have carried out the procedure on an X-ray fluoroscopic table. The catheters used are No. 8 or No. 9 radiopaque ureteral catheters approximately 80 cm long.* A slight permanent angulation

about 4 cm from the tip to about 30° from linear has proven to be very useful. At all times while the catheter is in place a slow drip of physiological saline solution is passed through it. One must constantly be vigilant that the flow of saline is continued, because clotting within the catheter will occur if the flow is stopped. Before blood samples are withdrawn for analysis a small amount must be withdrawn and discarded so that the sample will not be contaminated by the saline in the catheter.

With local procain anesthesia a small incision is made over the basilic vein in either antecubital space. The cephalic vein is not used because of frequent difficulty in passing the catheter over the course of this vein. The vessel is isolated and a transverse slit made in its wall. The tip of the catheter is introduced into the vein and passed up the arm and into the auricle under fluoroscopic guidance. The catheter is then rotated so that the curvature of the tip is directed to the patient's right. It is then advanced downward and should pass out of the auricle into the inferior vena cava. If the catheter enters

² Forssmann, W., *Klin. Wschr.*, 1929, **8**, 2085.

³ Cournand, Andre, and Ranges, Hilmert A., *PROC. SOC. EXP. BIOL. AND MED.*, 1941, **46**, 462.

⁴ Cournand, A., Riley, R. L., Bradley, S. E., Breed, E. S., Noble, R. P., Lauson, H. D., Gregersen, M. I., and Richards, D. W., *Surgery*, 1943, **13**, 964.

* Obtained from the United States Catheter and Instrument Co., Glens Falls, New York.

the hepatic vein it will almost immediately be seen to pass to the right and downward into the right upper quadrant of the abdomen. The position at this time is quite distinctive, as shown in Fig. 1. Instead of passing into the hepatic vein the catheter may pass into the right ventricle or almost straight downward in the inferior vena cava. In either event it may be returned to a higher level, rotated, and further attempts made to manipulate the tip into the hepatic vein. At all times the manipulations should be gentle, force never being used.

As pointed out by Cournand and Ranges,³ the catheter may not always pass in the desired direction, but on repeated manipulation we have been able to reach the right auricle in over 90% of the cases attempted. The most frequent cause of failure has been spasm of the peripheral vein, which makes rotation and movement of the catheter difficult and painful. A rest period and additional local anesthesia at the site of insertion may relieve this. If the auricle has been reached, and there is little or no spasm, we have been able to enter the hepatic vein in most instances, but failure may occur if the catheter repeatedly passes into the right ventricle or the inferior vena cava and cannot be guided into the hepatic vein.

On removal of the catheter the skin is closed with several silk sutures, but the vein is not tied off. If bleeding occurs, it is controlled

with a pressure bandage. A small linear venous thrombosis may develop locally, but in most instances the vein recanalizes within 2 or 3 weeks.

Although this was not the primary purpose of our work, we have made a few observations on hepatic vein blood. The hematocrit reading and hemoglobin content of blood from the liver did not differ from simultaneously obtained arterial blood specimens. The oxygen content of the hepatic vein blood in 6 patients has been somewhat lower than that of mixed venous blood obtained from the right auricle. In the fasting subject the non-protein nitrogen content was not significantly different from arterial blood, while the glucose level was only slightly lower in hepatic vein blood.

In addition to the above data we have made observations upon the bacterial colony counts in hepatic vein blood in patients with subacute bacterial endocarditis. This work, done in collaboration with Dr. Paul B. Beeson, is to be reported in detail elsewhere.

Summary. A method is described for obtaining samples of blood from the hepatic vein in man by means of a catheter in the venous system. Only a moderate amount of skill is required, and if carried out with care, samples can be obtained with minimal discomfort and danger to the subject.

The authors are deeply indebted to Dr. Andre Cournand and his associates for the fundamental training in the methods utilized in this work.

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Delayed Contraction of Denervated Muscle with Intravenous Barbiturates.*

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It is a known fact that denervated striated muscle contracts when in contact with cholinergic substances that have nicotinic properties. Intravenous injections of minute doses of acetylcholine and certain carbaminocholine derivatives produce a contraction of denervated facial muscles within the circulation

time.¹ Large doses of epinephrine also cause the denervated facial muscle to contract, but

* This work has been partly aided by a grant from the Josiah Macy, Jr., Foundation.

¹ Bender, M. B., Spirtes, M. A., and Sprinson, D. B., *J. Pharm.*, 1943, **77**, 107.